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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/632,956

08/04/2003

Woo-Seok Yang

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7590

12/02/2004

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EXAMINER

VU, HUNG K

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 12/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/632,956	<b>Applicant(s)</b> YANG ET AL.	
	<b>Examiner</b> Hung Vu	<b>Art Unit</b> 2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 16 September 2004.  
 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.  
 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-8, 10 and 11 is/are pending in the application.  
     4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
 6) ☒ Claim(s) 1-8, 10 and 11 is/are rejected.  
 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
     a) ☐ All    b) ☐ Some \* c) ☐ None of:  
         1. ☐ Certified copies of the priority documents have been received.  
         2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
         3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 – 8 and 10 – 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicants' Admitted Prior Art of Figure 1 in view of Argos, Jr. et al. (PN 5,438,023, of record). Argos, Jr. et al. discloses a semiconductor device for use in a memory cell, comprising:

an active matrix provided with a semiconductor substrate (2), a transistor formed on the semiconductor substrate, an isolation region (4) for isolating the transistor and a first insulating layer (16) formed on top of the transistor and the isolation region;

a capacitor structure (23), formed on top of the first insulating layer, composed of a bottom electrode (20A), a capacitor thin film (22A) placed on top of the bottom electrode and a top electrode (24A) formed on top of the capacitor thin film;

a second insulating layer (26) formed on top of the transistor and the capacitor structure;

a metal interconnection (36) formed on top of the second insulating layer to electrically connect the transistor to the capacitor structure;

an inter-metal dielectric (IMD) layer (not shown) formed on top of the capacitor structure.

Applicants' Admitted Prior Art of Figure 1 does not disclose a barrier layer formed between the metal interconnection and the IMD. However, Argos, Jr. et al. discloses the barrier layer (34)

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formed between a metal interconnection (30) and an IMD (34). Note Figure 4 of Argos, Jr. et al.. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the device of Applicants' Admitted Prior Art of Figure 1 having the barrier layer formed between the metal interconnection and the IMD, such as taught by Argos, Jr. et al. in order to protect the capacitor structure from the hydrogen diffusion.

Note that the terms "by using a plasma chemical vapor deposition (CVD) in a hydrogen rich atmosphere", "the plasma CVD is carried out at a low temperature by using silane ( $\text{SiH}_4$ ) as a source gas", "barrier layer is formed by using an atomic layer deposition (ALD) method", "the ALD method is carried out by using trimethyl aluminum (TMA) and  $\text{H}_2\text{O}$  as a source gas and using  $\text{N}_2$  as a purge gas" are method recitations in a device claimed. Note that only the final product is relevant, not the method of making. A product by process claim is directed to the product per se, no matter how actually made. See also MPEP 2113. Moreover, an old or obvious product produced by a new method is not a patentable product, whether claimed in "product by process" claims or not. Note that Argos, Jr. et al. also discloses the barrier layer (34) is formed by plasma CVD.

Applicants' Admitted Prior Art of Figure 1 and Argos, Jr. et al. do not teach to form an additional metal layer having a barrier layer and a passivation layer formed on top of the additional barrier. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the device of Applicants' Admitted Prior Art of Figure 1 and Argos, Jr. et al. having an additional metal layer having a barrier layer and a passivation layer formed on top of the additional barrier in order to have a multi-level interconnect.

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With regard to claim 2, Applicants' Admitted Prior Art of Figure 1 and Argos, Jr. et al. disclose the capacitor tin film is made of ferroelectric material selected from a group consisting of SBT.

With regard to claim 3, Applicants' Admitted Prior Art of Figure 1 and Argos, Jr. et al. disclose the IMD is made of  $\text{SiO}_2$ .

With regard to claim 5, Applicants' Admitted Prior Art of Figure 1 and Argos, Jr. et al. disclose the barrier layer is made of  $\text{Al}_2\text{O}_3$ .

With regard to claim 6, although Applicants' Admitted Prior Art of Figure 1 and Argos, Jr. et al. do not teach the exact the thickness of barrier layer, as that claimed by Applicants, however, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the barrier layer having a desired thickness, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

With regard to claims 10-11, Applicants' Admitted Prior Art of Figure 1 and Argos, Jr. et al. do not teach to form an additional metal layer having a barrier layer and a passivation layer formed on top of the additional barrier. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the device of Applicants' Admitted Prior Art of Figure 1 and Argos, Jr. et al. having an additional metal layer having a barrier layer and a passivation layer formed on top of the additional barrier in order to have a multi-level interconnect.

***Response to Arguments***

2. Applicant's arguments filed 09/16/04 have been fully considered but they are not persuasive.

It is argued, at page 8 of the Remarks, that Argos et al. disclose the passivation layer 34 is formed on the SiO<sub>2</sub> layer after the formation of the SiO<sub>2</sub> layer which is different the claimed invention which requires the first barrier layer 238 formed on the metal interconnection 234 and 236. This argument is not convincing because Argos et al. discloses the barrier layer (34) formed on a metal interconnection (30). Note that the word "on" does not necessarily mean "in directly contact with".

***Conclusion***

3. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

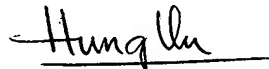
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hung K. Vu whose telephone number is (571) 272-1666. The examiner can normally be reached on Mon-Thurs 6:00-3:30, alternate Friday 7:00-3:30, Eastern Time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (571) 272-1732. The Central Fax Number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Vu

November 17, 2004

A handwritten signature in cursive script, appearing to read "Hung Vu", is written over a horizontal line.

Hung Vu

Patent Examiner